

REMARKS

Reconsideration of the above referenced application, as amended, is respectfully requested.

Request for withdrawal of the finality of the rejection in the Office Action dated April 8, 2004

The present application was initially rejected in an Office Action dated July 22, 2003. The basis of the rejection was 35 USC § 112 and 35 USC § 102(b). There was no rejection under 35 USC § 103. Applicants amended the claims to overcome the rejections under 35 USC § 112 which were withdrawn in the Office Action dated April 8, 2004. Additionally, independent claims 1 and 18 were amended to incorporate the limitation of original claim 9. Accordingly, applicants respectfully request withdrawal of the finality of the rejection in the Office Action dated April 8, 2004.

Amendment

Claims 1, 4, 15, 16, 19, 20 and 21 have been canceled.

Claims 3, 6, 7, 10, 11, 12, 13, 14 and 18 have been amended to incorporate the limitation of claim 2. Basis for the amendment to claim 18 is claim 2 now canceled, page 3, line 32 to page 4, line 3; page 6, line 26 to page 7, line 9. Claims 3, 6, 7, 10, 11, 12, 13 and 14 have been amended to change dependency to claim 18.

The Present Invention

The present invention of amended claim 18 is directed to the simultaneous reduction of simultaneous reduction of N₂O and NO_x in the presence of ammonia using a BETA zeolite catalyst at a temperature of greater than about 250°C.

Claim Rejections - 35 USC § 102

Claims 1-4, 10-16 and 18-21 were rejected under 35 USC § 102(b) over WO 97/10042 to Fetzer, et al. (Fetzer), reference being made to corresponding U.S. Patent No. 6,056,928. Claims 1, 10-11, 15-16 and 18-21 were newly rejected under 35 USC § 102(b) over U.S. Patent No. 4,867,954 to Staniulis, et al. (Staniulis).

Fetzer

Reconsideration of the rejection of claim 18 as anticipated by Fetzer is requested for the following reasons.

Fetzer discloses a multiple step process. In step B, Fetzer discloses the use of BETA zeolite to reduce N₂O, but this is not disclosed in the presence of ammonia. Fetzer does not disclose or suggest the use of ammonia in combination with BETA zeolite for ammonia-mediated reduction of nitrous oxide. Fetzer discloses the use of ammonia in the presence of catalysts (which do not include zeolites) in Stage C for "reduction of nitrogen oxides other than N₂O" (Fetzer col. 4, lines 35-36). Accordingly, Fetzer does not anticipate claim 18. Furthermore the claims depending from claim 18 include the limitations thereof and are not anticipated by Fetzer.

In the referenced Office Action the Examiner asserts, "Fetzer '928 discloses a method of removing nitrogen oxides from a gas flow comprising contacting the flow with a beta zeolite and ammonia (see column 4, lines 14-21 and 37-41)." (O.A. Page 2). Additionally, the Examiner asserts (O.A. Page 7) that, applicants' argument "is not persuasive because Fetzer nowhere discloses that beta zeolite is removed after stage B, as Applicant appears to suggest. Fetzer discloses both the use of beta zeolite and "use of ammonia in stage C, and also that the streams of A and B are put through stage C (see column 4, lines 28-30)." Reconsideration of this assessment of applicants' argument is respectfully requested. Applicants are of the position that the beta zeolite of Fetzer is located in stage B which

is separate from stage C. There is no disclosure in Fetzer of beta zeolite in stage C so as to be in contact with both N_2O and ammonia. This is confirmed by the Examiner's citation to Fetzer col. 4, lines 28-30 and the Figure.

Therefore, reconsideration of this rejection is requested for the following reasons. Initially, Fetzer states at cited column 4, lines 28-30 that "the gas stream from stages A and B can be passed through a stage C for reducing nitrogen oxides other than N_2O ." Additionally, Fetzer recites at column 4, lines 35-36 that, "Stage C is for the reduction of nitrogen oxides other than N_2O ." The Stages of A, B and C are set for beginning at column 5, line 5. Figure 1 and the related description at column 6 show Stage B ("C1") to be a separate operation from Stage C ("C2"). Furthermore, there is no disclosure in Fetzer to add ammonia in Stage B, nor is there any disclosure that Beta zeolite is used in Stage C. The catalyst used in Stage C is disclosed in Fetzer at column 4, lines 37-57. Accordingly, claim 18 and the claims dependent therefrom are not anticipated by Fetzer.

Additionally, present claim 18 is directed to a method for ammonia-mediated N_2O and NO_x reduction, comprising contacting a gas stream containing N_2O and NO_x with ammonia and with a catalyst bed comprising a BETA zeolite.

For the above reasons Fetzer does not disclose or suggest the use of ammonia in combination with BETA zeolite for ammonia-mediated reduction of nitrous oxide as presented in claim 18. Accordingly, Fetzer does not anticipate claim 18. Furthermore the claims depending from claim 18 include the limitations thereof and are not anticipated by Fetzer.

Staniulis

Reconsideration of the rejection of claim 1 as anticipated by Staniulis is requested for the following reasons.

Claim 18 has been amended to incorporate the limitations of claim 2 which was not rejected under 35 USC § 102(b) over Staniulis and claim 2 has been cancelled.

For the above reasons, presently presented claims 3, 10-14, and 18 are not anticipated by Fetzer or Staniulis.

Claim Rejections - 35 USC § 103

Claims 1-4, 10-16 and 18-21 were all newly rejected under 35 USC § 103 over U.S. Patent No. 5,200,162 to Riley, et al. (Riley) in view of Fetzer. Reconsideration is requested for the reasons that follow.

Initially, and as discussed below, the cited references recognize a difference in the treatment for the reduction of nitrogen oxides (NO and NO_x) and nitrous oxide (N_2O). Applicants have claimed simultaneously reducing nitrogen oxides and nitrous oxide using BETA zeolite in the presence of ammonia at a temperature of greater than about 250°C . For the reasons that follow independent claim 18 is not obvious over Fetzer in view of Riley.

Fetzer is cited as disclosing the use of beta zeolites. However, this disclosure relates to the reduction of nitrous oxide in the absence of ammonia in Stage B. For the reasons presented above, Fetzer teaches those skilled in the art that in Stage C when ammonia is added the result is, "the reduction of nitrogen oxides other than N_2O ". (Fetzer col. 4, lines 35-36) This is contrary to the presently claimed invention which requires BETA in combination of ammonia to simultaneously reduce of N_2O and NO_x .

Furthermore, the cited passages of Riley are consistent with Fetzer and do not teach the reduction of nitrous acid in the presence of beta zeolite and ammonia.

The cited passage from Riley at column 4, lines 34-38 follows:

"Various kinds of materials have been utilized as solid catalyst for the decomposition of N_2O , but it appears possible to classify them into four categories; metal oxides, metals, zeolites, and a nondescript group encompassing a diversity of otherwise unrelated materials."

The full passage from Riley at column 8, lines 46-59 follows:

"The removal of NO_x from various kinds of waste gases is a well known process practiced in many variants and needs to extensive discussion. See, e.g., Kirk-Othmer, "Encyclopedia of Chemical Technology," 3rd Edition, Vol. 9, pp. 527-30. **One quite highly preferred variant, which is particularly suitable is the selective reduction of NO_x with ammonia in the presence of oxygen,** often catalyzed by precious metals. In this variant, which is particularly suitable in the practice of our invention, any excess ammonia exiting the NO_x-decomposition zone and entering the N₂O-decomposition zone will not be harmful to most of the N₂O-decomposition zone catalysts and in fact will itself be decomposed in the N₂O-decomposition zone, with quite desirable consequence that the gaseous effluent discharged into the atmosphere does not have to be separately treated to remove ammonia." (Bold is citation in the Office Action.)

Therefore, where ammonia is disclosed by Riley it is referencing a disclosure in Kirk-Othmer for the reduction of NO_x. This is for the purpose of treating a stream containing NO_x and N₂O using a precious metal catalyst. There is no disclosure or suggestion to use the presently claimed combination of BETA zeolite and ammonia to treat N₂O as well as NO_x. Riley is concerned that the ammonia will not be harmful to the N₂O-decomposition zone catalysts and that the effluent does not have to be treated to remove ammonia.

Furthermore, Riley is concerned that the gas must be cooled (col. 3, lines 1-9); but there is no disclosure or suggested in Riley that the gas stream containing nitrous oxide and ammonia has a temperature of greater than about 250°C as presently claimed.

Therefore, there is no disclosure or suggestion in either of Fetzer or Riley of simultaneously reducing nitrogen oxides and nitrous oxide using BETA zeolite in the presence of ammonia at a temperature of greater than about 250°C. Accordingly, a combination of these references does not lead to the invention of claims 18, or claims depending therefrom which include the limitations of the respective claims upon which they depend.

Claims 1-7, 10-16 and 18, 19 and 21 were all newly rejected under 35 USC § 103 over U.S. Patent No. 4,571,329 to Kato, et al. (Kato) in view of Fetzer. Reconsideration is requested for the reasons that follow.

Fetzer is cited to disclose beta zeolite. Reference is made to the above discussion of Fetzer.

Kato is cited as disclosing a process for ammonia reduction of nitrous oxide comprising contacting nitrous oxide containing gas with ammonia (abstract) and a zeolite (col. 3, lines 43-48). Note in the Office Action at page 5, line 16 applicants consider the reference to "Riley" to be "Kato".

The present invention is directed to the simultaneous reduction of N_2O and NO_x treating a gas stream containing N_2O and NO_x with ammonia and a Beta zeolite at a specific temperature range. Kato is directed to treating a stream containing gas stream containing NO_x with ammonia and a catalyst which can include zeolites in general. There is no disclosure to treat a stream which contains N_2O . The exhaust gas targeted by Kato has a proportion of NO_2 in NO_x of 80% NO_2 and 20% NO as recited at col. 1, lines 38-42.

Accordingly, Kato is directed to a completely different process than the present invention. Where N_2O is an issue it is as a by-product of the reduction of N_2O and NO_x .

Fetzer teaches Beta zeolite is used to reduce N_2O ; but Fetzer does not disclose the use of ammonia to reduce N_2O . Fetzer uses ammonia when reducing NO_x . Therefore, one skilled in the art would not combine Fetzer with Kato to simultaneously reduce N_2O and NO_x as presently claimed.

Therefore, there is no disclosure or suggestion in either of Fetzer or Kato to mediate the reduction of nitrous oxide with ammonia where the catalyst is BETA zeolite. Accordingly, a combination of these references do not lead to the invention of claim 18, or claims depending therefrom which include the limitations of the respective claims upon which they depend.

Claims 1-3, 10-16 and 18-21 were rejected under 35 USC § 102(b) (Applicants believe the Examiner intended the statute to be 35 USC § 103) over U.S. Patent No. 5,200,162 to 5,756,057 to Tsuchitani, et al. (Tsuchitani) in view of Fetzer.

Fetzer is cited to disclose beta zeolite. Reference is made to the above discussion of Fetzer.

Tsuchitani is cited as disclosing a method of removing NO_x comprising contacting a stream containing N₂O with a reducing agent such as ammonia and a catalyst comprising a zeolite. In particular Tsuchitani is cited at col. 4, lines 33-36, 41-43 and 48-50. Further, Tsuchitani is cited as disclosing a catalyst comprising a zeolite at col. 5, lines 7-11 and Example 21, and Table 1.

Tsuchitani discloses at col. 4, lines 33-50, an exhaust gas which contains NO_x is brought into contact with a component manifesting an oxidizing activity in an oxidizing atmosphere so that NO, N₂O, etc. which are disclosed by Tsuchitani to be present at high proportions in the NO_x components to be converted to NO₂. It is then that a reducing substance is introduced into the exhaust gas enveloping adsorbed NO_x. The catalyst of Tsuchitani discharges the function of reducing or decomposing the NO_x. The reducing agent can be ammonia.

Additionally, Tsuchitani is cited as disclosing the use of a catalyst used with the reducing agent at col. 5, line 7-11, and the zeolite ZSM-5 in Example 21.

Tsuchitani does not disclose or suggest the invention of presently amended claim 18. Claim 18 requires the ammonia-mediated N₂O and NO_x reduction, comprising contacting a gas stream containing N₂O and NO_x with a catalyst comprising BETA zeolite to achieve the simultaneous reduction of N₂O and NO_x. This is contrary to Tsuchitani which requires an oxidation step to oxidize any N₂O to NO₂ before the reduction step. This distinction is recited in Tsuchitani at col. 4, lines 33-38. In the Examples the gas is not disclosed to contain any N₂O. In Example 21, the NO_x reducing catalyst is the zeolite, ZSM-5, which was not disclosed to simultaneously reduce NO_x and N₂O.

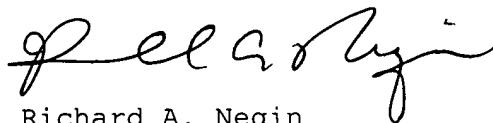
Accordingly, there is no disclosure in Tsuchitani which the skilled artisan would combine with the disclosure of BETA zeolite in Fetzer to make obvious the method of presently amended claim 18. As reviewed above, Fetzer discloses the use of BETA zeolite to reduce N_2O , but this is not disclosed in the presence of ammonia. Fetzer further requires in subsequent step C to reduce NO_x in the presence of ammonia but without a zeolite catalyst. Fetzer indicates that step C is used to reduce nitrogen oxides other than N_2O .

Therefore, there is no disclosure or suggestion in either of Fetzer or Tsuchitani to mediate the reduction of nitrous oxide with ammonia where the catalyst is BETA zeolite. Accordingly, a combination of these references do not lead to the invention of claim 18, or claims depending therefrom which include the limitations of the respective claims upon which they depend.

Applicants request withdrawal of the finality of the rejection in the Office Action dated April 8, 2004. Additionally, withdrawal of the rejection of the amended claims 18 and 3, 5-7, and 10-14 which depend from claim 18, under 35 USC § 102(b) and 35 USC § 103 and allowance of said claims is respectfully requested.

Applicants submit the application is in condition for allowance and respectfully request the same. Should the Examiner have any further questions or require further clarification, the Examiner is invited to telephone the undersigned at the number given below.

Respectfully submitted,



Richard A. Negin
Reg. No. 28,649

Engelhard Corporation
101 Wood Avenue - P.O. Box 770
Iselin, New Jersey 08830-0770
Tel. (732) 205-6241